REMARKS

Applicant thanks the Examiner for the courtesies extended to the undersigned in the telephone interview on November 28, 2006.

Claims 3-19 and 21 are pending in the subject application, with claims 1, 2 and 20 having previously been canceled, without prejudice or disclaimer. By this Amendment, claim 21 has been amended to depend from new claim 21. Accordingly, claims 3-19 and 21 are presented for reconsideration, with claim 21 being the sole pending claim in independent form.

Support for the claim amendments may be found, inter alia, in the specification at page 24, lines 5-21.

Rejection Under 35 U.S.C. §112, Second Paragraph

On page 2 of the July 27, 2006 Office Action, claims 3-19 and 21 were rejected under 35 U.S.C. §112, second paragraph, as purportedly indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The Examiner stated that the claim limitation ''…without accompanying an opening cells step, called healthy bubble…'' in combination with the limitation ''…making cells intercommunicate to each other…'' is confusing because the two limitations are in conflict with each other when the terminology ''healthy bubble'' is looked at in light of the supporting disclosure. The Examiner further stated that ''healthy bubble'' in the context of this invention is understood to mean the step of opening cells by destroying the membranes of the cells. The Examiner also stated that ''healthy bubble, from the standpoint of claim interpretation, can be cell opening/membrane destruction through any means, and it appears evident that by forming open-celled/intercommunicating celled blocks, by definition, employs

the very operation ''healthy bubble'' that applicants are claiming to avoid. The Examiner stated that it cannot be determined, in the instant case, what cell opening/membrane destroying operations constitute ''healthy bubble'' and which ones do not.

The Examiner stated that the term ''healthy bubble'' from the standpoint of claim interpretation cannot be afforded the definition of ''healthy bubble'' proffered by applicant's supporting disclosure at page 7 bridging page 8.

By this Amendment, claim 21 has been amended, and it is submitted that claim 20 clearly and distinctly points out the subject matter which applicant regards as the invention.

Reconsideration and withdrawal of the rejection under 35 U.S.C. §112, second paragraph, is respectfully requested.

Information Disclosure Statement

Applicant directs the Examiner's attention to the following references which are listed on Form PTO-1449 attached hereto as **Exhibit A:**

1) U.S. Patent No. 5,011,908 to Hager, issued April 30, 1991;
2) U.S. Patent No. 5,219,892 to Suhoza, issued June 15, 1993;
3) U.S. Patent No. 5,219,893 to Konig et al., issued June 15, 1993;
4) U.S. Patent No. 6,184,262 to Suhoza et al., issued February 6, 2001;
5) U.S. Patent No. 6,642,283 to Ragsdale et al., issued November 4, 2003;
6) U.S. Patent Application Publication No. 2006/0069174 A1 of Radford et al., published March 30, 2006;
7) European Patent Application Publication No. 0 437 787 A1 of

Konig et al., published July 24, 1991;

8) Saunders, J. H., Rubber Chem. Technol. 33 (1960);
9) Saunders, J. H. and K. C. Frisch, Polyurethane, Chemistry and Technology, Part 1, Chemistry; and
10) "Flexible Polyurethane Foams", DOW POLYURETHANES (November 2006).

Copies of references 1-10 are attached hereto as **Exhibits 1-10**, respectively.

The step of destroying the membrane of cells as described in the application at page 7, lines 8-17, is called "healthy bubble", "blowing off", or "the opening cell", and it is submitted that the term "healthy bubble" or "health bubble" is well understood in the art, as exemplified by references 1-10.

Reference 1 (U.S. Patent No. 5,011,908) states "until the height of the foam reaches full rise, and blow off occurs", and suggests that whether the foaming has been carried out is confirmed normally by checking whether blow off has occurred.

Reference 2 (U.S. Patent No. 5,219,892) and reference 4 (U.S. Patent No. 6,184,262) indicate that a person skilled in the art confirms whether the cells are intercommunicated to each other based on the presence of healthy bubble.

Reference 3 (U.S. Patent No. 5,219,893) states that "sudden evaporation of a mixture of gas, that is, the blow-out process starts, and a number of small craters are generated on the surface of the foam. The blow-out process is a visual sign that the foam has been intercommunicated."

Reference 5 (U.S. Patent No. 6,642,283) indicates that it is

confirmed whether the cells are intercommunicated to each other based on the presence of healthy bubble.

Reference 6 (US 2006/0069174 A1) indicates that a person skilled in the art judges whether a formulation is correct, by whether healthy bubble occurs.

Reference 7 (EP 0 437 787 A1) states that "sudden evaporation of a mixture of gas starts, and a number of small craters are generated on the surface of the foam. The blow-out process is a visual sign that the foam has been intercommunicated".

Reference 10 (DOW POLYURETHANES) shows in FIG. 3.23 a "BLOW OFF POINT", and states that this occurs in an instant.

Reference 8 (Saunders 1960) and reference 9 (Saunders and Firsch) are referenced in the application. FIG. 7 of reference 8, shows cells open, and the corresponding discussion in reference 8 states that this occurs in an instant when the volume of the foam reaches a maximum value. In addition, the caption of FIG. 7 of reference 8 indicates "the natural opening of the foam cells (i.e., not due to mechanical crushing)". Reference 9 states that "The opening of the cells occurs when the foam reaches its maximum height. It is proposed that the cells open at the time when the last surge of gas is observed. That is, it was common knowledge in the industry to intercommunicate the cells by "the opening of the cells".

As discussed in reference 8 (Saunders 1960) and reference 9 (Saunders and Frisch), it was understood by persons skilled in the art that "healthy bubble" was typically generated when conventional methods of manufacturing a flexible polyurethane foam block were utilized, and that the conditions of healthy

bubble are assumed to be an optimum state in the conventional approach for manufacturing flexible polyurethane foam block.

Applicant submits that a person skilled in the art would have acknowledged that prior to the invention made by applicant, intercommunication due to the healthy bubble which occurs when the foam reaches a maximum height was accepted to be an indispensable step (that is, in conventional methods of manufacturing a polyurethane foam).

This Information Disclosure Statement is filed pursuant to 37 C.F.R. §1.97(c)(2). The fee under 37 C.F.R. §1.17(p) for filing an Information Disclosure Statement pursuant to 37 C.F.R. §1.97(c)(2) is ONE HUNDRED AND EIGHTY DOLLARS ($180.00) and a check covering that amount is enclosed.

Applicant respectfully requests the Examiner to consider references 1-10, place the Examiner's initials on the attached Form PTO-1449 next to the entries corresponding to each reference to indicate that the reference has been considered, and forward a copy of the Form PTO-1449 bearing the Examiner's initials to applicant.

Rejection Under 35 U.S.C. §102(b)

On page 4 of the July 27, 2006 Office Action, claims 3-19 and 21 were rejected under 35 U.S.C. §102(b) as purportedly anticipated by U.S. Patent No. 4,264,743 to Maruyama et al.

The Examiner stated that Maruyama discloses preparations of flexible open-celled polyurethanes having low-air permeability and being formed from feedstock including polyols, isocyanates, catalysts, foaming agents, oxyalkylene-siloxane foam stabilizers, and hydrocarbon fluid compounds which read on the processes and

products claimed. The Examiner further stated that Maruyama discloses ethylene oxide(EO)/propylene oxide(PO) and air permeability values meeting those of applicants' claims. The Examiner also stated that based on its disclosure of suitable operation over the full range of molecular weights values of applicants' claims, it is held that Maruyama's disclosure readily envisions the molecular weight content values set forth by applicant's claims. Maruyama et al. is further not seen to be limited to the disclosure of its illustrative examples.

The Examiner stated that Maruyama's formed products appear to have consistency in permeability values throughout the samples they test. The Examiner further stated that since difference is not seen in the products realized, it is seen that the ranges of variation of air permeability values now recited in applicants'' claims are inherent to the teaching of Maruyama et al.

The Examiner stated that as to the size of the blocks of Maruyama, the claims of the instant invention do not distinguish based on block size. The Examiner stated that Maruyama does disclose the relevant thickness for testing of 10 mm thickness.

The Examiner stated that Maruyama's disclosure of other means of open-cell formation which <u>may</u> differ from the cell-opening operation of applicant's claim in some of their embodiments does not derogate from the teachings of Maruyama taken as a whole.

Applicant maintains that Maruyama fails to teach or suggest each and every element of the subject matter of amended claim 21 of the present application.

Maruyama, as understood by Applicant, proposes an open-cell, polyurethane foam sealing material with a waterproofness property. Maruyama proposes the use of a silicone surfactant as a foam stabilizer, and the silicone surfactant is selected based

on its influence on the waterproofness property.

However, Maruyama does not teach or suggest the subject matter of amended claim 21 of the present application, that is, a method of manufacturing a very low air-permeability polyurethane foam block, featured in employing, as the foam stabilizer, polysiloxane-polyoxyalkylene copolymer containing a functional group capable of chemically bonding to an isocyanate group at a terminal of polyoxyalkylene chain, the polyoxyalkylene chain having a number average molecular weight ranging from 400 to 1000, and a weight ratio between ethylene oxide and propylene oxide in the polyoxyalkylene chain being in a range of 70/30 to 0/100, thereby gradually emitting a part of a gas generated in a reaction from an entire top surface of the foam block to the atmosphere and intercommunicating the cells during forming of the foam block, and the foam thus obtained has a variation in air-permeability throughout the entire body thereof is confined to not more than 1 $cc/cm^2/sec$.

The subject matter of amended claim 21 of the present application employs a specific silicone foam stabilizer. Use of such silicone foam stabilizer enables the resulting foam to have an air-permeability of no more than 5 $cc/cm^2/sec$ and a variation in air-permeability throughout the entire body thereof is confined to not more than 1 $cc/cm^2/sec$. The association between the silicone foam stabilizer and these air-permeability properties is described on page 24, lines 5-12 of the originally filed application which states:

> "... when the specific silicone foam stabilizer of the present application is employed, intercommunication of the cells starts from a relatively early stage in the reaction

before the foam reaches its maximum height. A part of the generated gas is sequentially diffused into the atmosphere from the entire top surface of the foam block".

This characteristic intercommunication process occurs by very fine holes being opened in the cell membrane. As a result, it is possible to obtain an open-cell foam flexible polyurethane foam block having an air-permeability of no more than 5 cc/cm^2/sec and a variation in air-permeability throughout the entire body of no more than 1 cc/cm^2/sec.

The difference between the foam stabilizer of the present application and a widely used foam stabilizer is as shown in Table 1 (attached as **Exhibit B** hereto). As described on page 25, lines 8-15 of the application, the specific silicone foam stabilizer of the present application has an extremely low surfactant effect. That is, as shown in Table 1, the specific silicone foam stabilizer of the present application has the following advantage due to the structure specified in the claims.

As the polyoxyalkylene chain end has a functional group which can chemically bond with an isocyanate group, the cross-linking effect complements the low surfactant effect.

As the number average molecular weight of the polyoxyalkylene chain is 400-1000, the hydroxyl value (i.e., hydroxyl number) becomes relatively high, and the reaction activity is also high. The entire molecular weight becomes small due to the small molecular weight of the repeating unit n.

Thus, the surfactant effect is low.

As described above, the foam stabilizer of the present application has a low surfactant effect and high reaction activity. Thus, the foam stabilizer which has reacted loses the foam stabilizing property sequentially, and fine holes are opened at that part of the cell. This is described on page 24, lines 5-12 of the application as "the intercommunication of the cells is permitted to initiate at a relatively early stage of reaction". It is described on page 17, lines 7-10 of the originally filed application that the size of the cells can be adjusted by selection of the EO/PO ratio specified in the claims.

If only very fine holes are opened in the cell membrane of the foam as shown in FIG. 4(G), the foam will have an extremely low air-permeability. In this case, the numerical value of air-permeability is no more than 5 cc/cm2/sec.

As in chemical reactions in general, the phenomenon of very fine holes being opened in the cell membrane does not occur locally, but occurs throughout the entire foam block. That is, very fine holes are opened throughout the entire foam block in the same way, and there is hardly any variation in air-permeability in each part of the foam block. The numerical value of the variation in air-permeability is no more than 1 $cc/cm^2/sec$.

The association between the function of the foam stabilizer and the intercommunication of the cells is further explained below.

The main functions of the foam stabilizer are as follows: (a) aid mixing and emulsification when mixing each ingredient; (b) aid forming cells by uniformly diffusing the air taken In during mixing; (c) lower the surface tension to prevent the cells from becoming rough and uneven when a generated air bubble grows; and (d) stabilize the cell membrane so that the cell does not break.

A set of Reference Materials 1-4 were attached as Exhibit 1 of the May 1, 2006 Amendment. However, in Reference Material 3, "E'" and "F" were reversed, while the explanation was correct. In the explanation, it was described that FIGS. 3(A)-(D) and FIGS. 4(A)-(D) show the major flow of the events shown, and FIGS. 3(A')-(D') and FIGS. 4(A')-(D^1) show the events taking place inside.

Attached hereto as **Exhibit C** is a replacement set of Reference Materials 1-5 (demonstrative Figs. 1-6), in order that the difference between the conventional manufacturing method and the method of the present application can be clearly understood. Reference Materials 3 and 4, we have shown the cells schematically, so as to make it easier to grasp the intercommunication between the cells during the inside change. Reference Material 5 is an enlarge image of FIG. 3(D'). Reference Material 6 is an enlarged image of FIG. 4(D'). A clearer electron micrograph is submitted in replacement of the previously submitted FIGS. 3(E') and 3(F'). A clear electron micrograph of the previously submitted FIG. 4(G) is also included in **Exhibit C** attached hereto.

As shown in Reference Material 1, the open-cell is a cell in which holes are opened in the cell membrane, and the cells adjacent to each other are connected. As described on page 23, line 18, through page 24, line 4 of the application, "in a conventional manufacturing method of a polyurethane foam block, the gas generated through a reaction is entrapped inside the foam until the foaming process is finished". As described on page 7, lines 8-17 of the application, "the gas pressure inside the foam is permitted to exceed over the strength of the cell membrane at the moment when the height of the foam being produced reaches maximum, thereby destroying the cell membrane and enabling the cells to be intercommunicated with each other". This is the so-called "healthy bubble". As described above, the function of the widely used foam stabilizer is maintained until the foaming process is finished (refer to Table 1). Thus, gas such as carbon dioxide and vapor generated during the foaming reaction cannot be extracted from the cells.

That is, it depends on the function of the foam stabilizer to intercommunicate the cells at which stage of the foam forming process. Here, the difference in the function of the foam stabilizer is determined by the structure of the foam stabilizer. As shown in Table 1, a feature of the foam stabilizer of the present application is that the reaction activity is high, and the surfactant property is low. Thus, the foam stabilizer which have been reacted lose the foam stabilizing property sequentially. As a result, very fine holes are opened at the part of the cell in which the foam stabilizing property has been

lost from a relatively early stage of the foam forming process, and the cells are intercommunicated. Conventionally, there were foam stabilizers having a cross-linking effect. However, as the reaction property was low, the characteristic intercommunication of subject matter of the present application did not occur.

Amongst the Examples of Maruyama, applicant obtained the following materials of Examples 1 and 2, and carried out a reproduction experiment (refer to Table 2). Although the obtained materials were not identical to those which the application used, the materials are nearly the same. Thus, the applicant considers that the confirmatory experiment effectively reproduces Examples 1 and 2 of Maruyama.

Applicant confirmed that a healthy bubble is observed when foaming is carried out using the foam stabilizer of Examples 1 and 2. In the foam obtained by the formulation of Examples 1 and 2, the variation in air-permeability between the upper region and lower region of the foam block was larger than 1 cc/cm2/sec.

The raw materials used were as follows:

Polyester polyol, Hitachi Kasei Polymer K.K product name: TA22558, synthesized from dimer acid and diethylene glycol, hydroxyl number 74.6, acid value 0.7, average functional group number 2;

tolylenediisocyanate; T-75 (75/25 mixture of 2,4- and 2,6-isomer);

water; distilled water;

triethylene diamine; Sankyo Air Products K.K. product name:

Dabco-33LV;

Octyl acid primary tin; Nittoh Kasei K.K. product name: Neostan U-28;

foam stabilizer; supplied by Shin-etsu Kagaku Kogyo K.K (similar to that used in Maruyama)

For Example 1...product name: X-20-6131

Polyoxyalkylene chain; a/b=75/25, MW=1600, R=H

Siloxane chain; m/n=27/3

For Example 2... product name: F-501

Polyoxyalkylene chain; a/b=75/25, MW=2000, $R=CH_3$*

"m/n"of siloxane chain is not disclosed

* As $R=C_4H_9$ is not a widely used product, we used R= $R=CH_3$ described in claim 6.

waterproof filing; 1:1 mixture of mitsui FTR (MITSUI PETROCHEMICAL CO. LTD.) and liquid paraffin.

Applicant used a polyesterpolyol having slightly a different number of hydroxyls than that of the polyesterpolyol used in Maruyama. Thus, the isocyanate index was calculated from the amount 28.9 parts of T-75 of Maruyama. The NCO% of T-75 isocyanate is 48, and the hydroxyl number of the polyol of Maruyama is 60. Thus, equivalent of isocyanate=42/48x 100=87.5 and equivalent of polyol=56/60*1000=933.3. If 100g of polyol is used, x=87.5/933.3*100=9.4. If 2g of water is used, y=87.5/9x2=18.4. Thus, z=x+y=28.8. As z'=28.9 in the Example of Maruyama, the isocyanate index of Maruyama is: z'/zx100=28.9/28.8x100=100.3

The letter x indicates the amount (g) of isocyanate required in stoichiometry to react all the hydroxyl groups of the polyol. The letter y indicates the amount (g) of isocyanate required in

stoichiometry to react all hydroxyl groups of the water. The letter z indicates the amount (g) of isocyanate required in stoichiometry with respect to the total amount of polyol and water. The letter z' indicates the actual required amount (g) of isocyanate.

The relationship between x, y and z is z=x+y. The relationship between z' and z is z'=zx(isocyanate index/100). The above-described x and y are shown by the following equation: x=(equivalent of isocyanate/equivalent of polyol) x amount of polyol used.

However, equivalent of isocyanate=(molecular weight of NCO/NCO%)x100=(42/NCO%)x100; equivalent of polyol=(molecular weight of OH x 2/hydroxyl number)x1000=(56/hydroxyl number)x1000; y=(equivalent of isocyanate/equivalent of water)x(amount of water used). However, equivalent of water=molecular weight of H_2O/valence=18/2=9.

The calculation formula of the isocyanate index and equal amount is used by a person skilled in the art. Thus, a person skilled in the art can easily understand the meaning, and carry out the calculation in the same way.

The amount of isocyanate used in the present experiment was calculated based on the calculated isocyanate index.

(Refer to the attached Explanation 2.)
The NCO% of T-75 isocyanate is 48, and the hydroxyl number of the polyol of present experiment is 74.6. Thus, equivalent of isocyanate=42/48x100=87.5 and equivalent of polyol=56/74.6x1000=750.7. If 100g of polyol is used, x=87.5/750.7x100=11.7. If 2g of water is used, y=87.5/9x2=19.4.

Thus, z=x+y=31.1. Therefore, the required amount (g) of isocyanate to be used in the present experiment is z'=31.1x100.3/100=31.2(g).

By experimenting with the calculated amount to be used, applicant's experiment to achieve the same condition as the Example of Maruyama.

INDEX of the Example of Maruyama: 100.3
Amount of isocyanate used in the Example of Maruyama: 28.9 parts INDEX of the present experiment: 100.9
Amount of isocyanate used in the present experiment formulation: 31.2 parts

The object of the experiment was to confirm whether a variation occurs in air-permeability of the obtained foam block when the foam stabilizer of Maruyama is used. In Maruyama, a waterproof filling was added to provide a hydrophobia property. However, the applicant judged that the object of the experiment can be sufficiently achieved even if the waterproof filling is omitted in the prescription.

Applicant carried out an experiment using the formulation of Table 2 (**Exhibit B** attached hereto). The physical property of the obtained foam was measured using the same method as the present application. The results shown in Table 2 were obtained.

However, in Table 2:

the experiment foam block size is 30cm long, 25cm wide, and 25cm high (dome shape having a maximum height of 30cm);

foam for measuring air-permeability of the upper region is a

foam which is 1cm thick and was taken from the part about 5cm away from the top surface of the foam block; and

foam for measuring air-permeability of the lower region is a foam which is 1cm thick and was taken from the part approximately 3cm away from the bottom of the foam block.

The air-permeability of the lower region of the obtained foam block is substantially the same as Maruyama. The air-permeability of the upper region of the obtained foam block was at least 1 $cc/cm^2/sec$ higher than the air-permeability of the lower region.

On the other hand, difference in air-permeability of the present application is less than $0.08cc/cm^2/sec$. The density of the obtained foam block was lower than that of Maruyama, as a waterproof filling which is an additive was not included.

Thus, it was confirmed that when a foam stabilizer of Maruyama was used, the variations occurred in the air-permeability of the obtained foam block.

Accordingly, it is submitted that Maruyama does not teach or suggest the subject matter of claim 21 of the present application.

Regarding claims 3-19, Applicant respectfully points out that claims 3-19 depend on and include all the limitations of claim 21. Thus, claims 3-19 are patentable at least for the reasons set forth above with respect to claim 21.

In view of the remarks hereinabove, Applicant maintains that claims 21 and 3-19 are now in condition for allowance. Accordingly, Applicant earnestly solicits the allowance of the application.

If a telephone interview would be of assistance in advancing prosecution of the subject application, Applicant's undersigned attorney invites the Examiner to telephone him at the telephone number provided below.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition, and the Commissioner is authorized to charge the requisite fees to our Deposit Account No. 03-3125.

No fee, other than the $450.00 fee for the two-month extension of time and $180.00 fee for consideration of the Information Disclosure Statement, is deemed necessary in connection with the filing of this Amendment. However, if any additional fee is required, authorization is hereby given to charge the amount of any such fee to Deposit Account No. 03-3125.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited this date with the U.S. Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Paul Teng — December 27, 2006

Paul Teng
Reg. No. 40,837 — Date